Evergreen Resources Management
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Wilmington, DE 19803

August 27, 2021

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Ms. Chelsea Fazzino, P.G.
Pennsylvania Department of Environmental Protection
2 East Main Street
Norristown, Pennsylvania 19401

RE: Groundwater Remediation Status Report, First Half 2021
Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC

Dear Ms. Fazzino,

The former Sunoco, Inc. (R&M) (Sunoco) Marcus Hook Refinery (facility) was officially entered into the Pennsylvania One Cleanup Program in November 2011. This First Half 2021 Groundwater Remediation Status Report for the facility was prepared to summarize work completed in support of the Work Plan for Site Wide Approach (SWAWP) which was under the Pennsylvania One Cleanup Program submitted to the Pennsylvania Department of Environmental Protection (PADEP) and the United States Environmental Protection Agency (USEPA) on December 19, 2011. The Corrective Action Framework (CAF) for the Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation of the former Marcus Hook Refinery was developed from 2014 through 2017 with input from the USEPA and PADEP. The CAF replaces the SWAWP as the article guiding the conclusions and recommendations resulting from the facility environmental investigations.

Sunoco previously operated the facility located at 100 Green Street in Marcus Hook, Pennsylvania. The facility was transferred to Sunoco Partners Marketing & Terminals L.P. (SPMT) on April 1, 2013 and the current facility is referred to as the Marcus Hook Industrial Complex (MHIC). As of December 30, 2013, Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC (Evergreen), assumed the responsibility for remediation liabilities occurring at the MHIC on or before that date.

Remediation technician services, project management, and project reporting are contracted to Stantec Consulting Services Inc. (Stantec). Status reports are currently provided on a semi-annual basis with sections organized according to the Areas of Interest (AOIs). Evergreen will submit a status report with the operation and maintenance (O&M) activity details, figures, and tables on an annual basis, coinciding with the annual groundwater gauging and monitoring event, completed during the fourth quarter of every year. On the alternating six month interval, Evergreen will submit an abbreviated letter report detailing the O&M activity without figures and with limited tables.

Unless otherwise noted, this status report covers O&M work completed between January 1, 2021 and June 30, 2021. Detailed information regarding O&M activity is included in the attached tables for the MHIC and Marcus Hook Tank Farm as prepared by Stantec.

AOI 1 – 10 Plant
There are no active remediation systems in AOI 1. Monitoring wells in AOI 1 are gauged annually during the fourth quarter.

AOI 2 – 12 Plant
There are no active remediation systems in AOI 2. Monitoring wells in AOI 2 are gauged annually during the fourth quarter.

AOI 3 – Facility Office Buildings
Two active remediation systems are located in AOI 3: the Laboratory Building Remediation System and the Green Street Remediation System.

Laboratory Building Remediation System
The Laboratory Building Remediation System includes pneumatic total fluids pumps at nine recovery wells (RW-5, RW-6, RW-7, RW-29, RW-30, RW-31, RW-32, RW-134, and RW-135).

Liquids from the pneumatic total fluids pumps are processed through a settling tank and an oil/water separator (OWS) within the treatment trailer. The recovered groundwater is pumped to the existing discharge location adjacent to RW-7 and subsequently transferred to the 15 Plant Separator. Recovered light non-aqueous phase liquid (LNAPL) is stored in two 550-gallon holding tanks and one 5,000-gallon holding tank. The recovered LNAPL is periodically pumped out and processed through the facility's slop oil system.

The remediation system was modified to include a larger OWS and a soil vapor extraction (SVE) blower in 2015. The effluent from the SVE system is treated by a Falmouth Falco 100 catalytic oxidizer. In December 2019, a chemical feed injection pump was installed to evaluate chemical additives to reduce iron fouling within the system piping. In May 2020, the chemical feed additive injection was started on RW-135 to reduce iron fouling of system piping. The chemical feed was operational during the reporting period.

A total of 2,212,314 gallons of groundwater and 1,298 gallons of LNAPL were recovered in the first half of 2021. Details of performance data for the Laboratory Building Remediation System operation are presented in **Attachment 1**.

Two solar powered LNAPL pumps were operated at select wells during the reporting period to evaluate the LNAPL recovery potential. Locations included MW-81, MW-99, MW-281, MW-492, and RW-20. During the reporting period, 30.3 gallons of LNAPL were recovered using the solar powered pumps. See **Attachment 1** for details.

Green Street Remediation System
The remediation system at Green Street consists of an interceptor trench with a combination of 12-volt and pneumatic LNAPL skimming pumps at nine wells (S-1, S-2, S-3, S-4, S-5, SS-1A(new), P-3, P-4, and P-5) within the trench. Due to an underground air leak, the LNAPL skimming pumps were removed from S-4 and P-5 in November 2014, and passive bailers were installed. On June 26, 2018 the passive bailer was removed and a skimmer pump was installed in S-4. During February and March 2019, modifications were made to the system which included replacing well vaults and the installation of 12-volt LNAPL pumps in P-4, P-5, and S-5. Product thicknesses are measured and pumps are turned on/off as needed based on recoverable product accumulations in each well. Passive bailers or sorbent wicks are installed in P-1, P-2, and SP-4A as needed to recover LNAPL. The recovered LNAPL is stored in a 1,100-gallon holding tank that is periodically pumped out, and the contents are processed through the facility's slop oil system. Evergreen is conducting additional testing and investigations to evaluate the current system and determine potential modifications or additions to remediation in the vicinity of the system. Information from these activities will be summarized in future submittals.

A total of 385 gallons of LNAPL was recovered by this system in the first half of 2021. Details of performance data for the Green Street Remediation System can be found in **Attachment 1**.

AOI 4 – Upper No. 1 Tank Farm
Two remediation systems are located in AOI 4: the 12 Tank Remediation System and the H-5/Post Road Remediation System.

12 Tank Remediation System
The 12 Tank Remediation System was started in 2001 and included pneumatic total fluids pumps in 12 recovery wells (RW-3, RW-16, RW-17, RW-18, RW-147, RW-148, RW-160, RW-161, RW-162, RW-163, RW-165, and RW-272) located on the west and south sides of 12 Tank, along Hewes Avenue and Post Road. On March 17, 2021, MW-196 and MW-197 were added to the remediation system. Groundwater and LNAPL are processed through an OWS. The recovered groundwater is pumped through an existing 10-inch diameter high-density polyethylene (HDPE) facility line to the Middle Creek Conveyance process sewer line southeast of 254 Tank. Recovered LNAPL is stored in a 550-gallon holding tank that is periodically pumped out and the contents are processed through the facility's slop oil system. In response to concentrations of VOC vapors in the utility manholes along Post Road, the SVE system, including MW-199, MW-200, RW-3, RW-147, RW-148, RW-160, and RW-161, was started on September 29, 2014. Volatile organic compound (VOC) vapors from the closed-vent system pass through an enclosed biofilter and granular activated carbon vessel. The treated air stream is subsequently vented to the atmosphere.

A total of 109,913 gallons of groundwater and 417 gallons of LNAPL was recovered by the 12 Tank Remediation System during the first half of 2021. Details of maintenance and performance data for the 12 Tank Remediation System can be found in **Attachment 1**.

H-5/Post Road Remediation System
The H-5/Post Road Remediation System consists of a series of total fluids extraction points around the H-5 Control Room and a row of extraction points along Post Road and west of Hewes Avenue in areas of known LNAPL presence. Currently, there are nine recovery wells (RW-247, RW-248, RW-249, RW-250, RW-251, RW-252, RW-253, RW-254, and RW-255) pumping from around the H-5 Control Room and eight recovery wells (RW-4, RW-150, RW-151, RW-152, RW-155, RW-156, RW-157, and RW-201) pumping along Post Road. Liquids recovered by the system are pumped to a benzene National Emissions Standards for Hazardous Air Pollutants (NESHAP) compliant facility process sewer.

A total of 997,733 gallons of total fluids was recovered by this system during the first half of 2021. Details of maintenance and performance data for the H-5/Post Road Remediation System can be found in **Attachment 1**.

The nine recovery wells around the H-5 Control Room also serve as SVE points. The system includes a Falmouth Falco 100 catalytic oxidizer to treat the SVE effluent. The SVE system was operational during the reporting period to provide additional control of indoor air. In September 2019, a sub-slab vapor control system was installed in the H-5 Control Room building which consists of a blower and Falmouth Falco 200 catalytic oxidizer to evacuate vapors from beneath the building at three sub-slab vapor points. The sub-slab vapor control system was operational during the reporting period.

AOI 5 – Lower No. 1 Tank Farm/15 Plant/17 Plant
Two remediation systems are located in AOI 5: the Middle Creek Remediation System and the Phillips Island Remediation System.

Middle Creek Remediation System
The Middle Creek Remediation System consists of two interceptor trenches located between the 15 Plant Separator and Middle Creek. The trenches are equipped with six-inch diameter recovery wells (RW-A1, RW-B1, and RW-B2) and pneumatic submersible pumps. Total fluids are recovered from the trenches and transferred directly to the facility's 15 Plant Separator. In January 2020, pneumatic cycle counters were installed on each recovery well to estimate groundwater pumping totals.

A total of 300,510 gallons of total fluids was recovered by this system in the first half of 2021. On February 19, sheening was observed in Middle Creek during weekly low tide observations, however the sheen was contained by booms to the upstream portion of creek. Details of performance data for the Middle Creek Remediation System can be found in **Attachment 1**.

Phillips Island Remediation System
The Phillips Island Remediation System is comprised of sheet pile walls and a network of recovery wells. The Phillips Island Remediation System is operated and controlled by equipment in two remediation system buildings: the Phillips Island Upper System and the Phillips Island Lower System. Recovered groundwater and LNAPL are conveyed from the Upper System to the Lower System and all fluids are pumped to the facility's process sump (W-21 Sump) for further treatment. The Phillips Island Remediation System discharges directly to the facility; there are no separators, totalizers, or holding tanks associated with this remediation system. O&M activities are conducted weekly. The sump is gauged on a weekly basis and LNAPL is removed via vacuum truck on an as needed basis.

The Lower System consists of total fluids extraction from 14 recovery wells (W-1, W-2, MW-113, MW-114, MW-213, MW-215, MW-218, MW-219, MW-221, MW-223, MW-245, MW-259, MW-260, and MW-261) located along the Delaware River and six sumps (SUMP-1, SUMP-3, SUMP-5, SUMP-7A, SUMP-8, and a large sump referred to as the BIG SUMP) located along a sheet pile wall formerly referred to as the Weeping Wall. MW-213 was added to the system on July 17, 2020 and was installed with a QED Environmental Systems Model AP-4 Pneumatic AutoPump. SUMP-7A operates with a QED Environmental Systems Model AP-4 Pneumatic AutoPump and a 1½-inch Wilden double diaphragm pump that is automatically actuated as needed to remove total fluids. The remaining pumping wells are driven by one 1½-inch Wilden double diaphragm pump mounted to a skid unit with 20 separate air actuated valves which permit each well to be optimized depending on its operating characteristics. Compressed air is supplied to the system by a Kaeser air compressor located inside the Lower System building.

The Upper System currently consists of total fluids extraction from 22 recovery wells along the West Wall (PI-1 through PI-15, MW-116, MW-116A, MW-216, MW-256, MW-257, MW-258, and MW-587). Wells MW-257, MW-258, and MW-587 were added to the system on January 10, 2019 and are equipped with QED Environmental Systems Model AP-4+ Pneumatic AutoPumps. The remaining recovery wells utilize a skid unit with a 1½-inch Wilden double diaphragm pump and 20 separate air actuated valves. Compressed air is supplied to the system by a Kaesar air compressor located inside the Upper System building.

A total of 11,096,267 gallons of groundwater and 2,665 gallons of LNAPL was recovered by the Phillips Island Remediation System during the first half of 2021. Details of maintenance and performance data for the Phillips Island Remediation System are provided in **Attachment 1**. Evergreen is conducting additional testing and investigations to evaluate the current system and determine potential modifications or additions to remediation in the vicinity of the system. Information from these activities will be summarized in future submittals.

AOI 6 – Lube Oil Center
There is one active remediation system located in AOI 6: the Bulkhead Remediation System. Historically, there were two other remediation systems in AOI 6: the RW-8 (No. 2 Dock) Remediation System and the Lube Oil Tank Field Remediation System (RW-9), which have not operated since 2009 and 2013, respectively, and will therefore not be discussed in this report.

Bulkhead Remediation System
The Bulkhead Remediation System consists of pneumatic total fluids pumps at four recovery wells (RW-12, RW-13, RW-14, and RW-15) adjacent to the bulkhead and adjacent to an abandoned sewer pipe. Total fluids are discharged to the facility's process sump (W-21 Sump) prior to transfer to the facility's 15 Plant Separator. This is the same sump that receives discharge of recovered fluids from the Phillips Island Remediation System (described previously). The sump is gauged on a weekly basis, and LNAPL is removed via vacuum truck on an as needed basis. The quantity of LNAPL recovered is accounted for within the Phillips Island Remediation System total.

Pneumatic cycle counters were installed on each recovery well to estimate groundwater pumping totals. A total of 2,387,433 gallons of total fluids was recovered by this system in the first half of 2021. Details of minor maintenance and performance data for the Bulkhead Remediation System can be found in **Attachment 1**.

AOI 7 – Delaware Portion of the Facility

One remediation system is located in AOI 7: the Delaware Seep Remediation System. The Delaware Seep Remediation System is located along the Delaware River and includes the Delaware Seep wells. These 10 recovery wells were installed along the Delaware River in the State of Delaware (OW-2, OW-3, OW-4, OW-9, OW-10, OW-11, and OW-12) and in Pennsylvania (OW-13, OW-14, and OW-15). The Delaware Seep Remediation System utilizes pneumatic submersible total fluids pumps. The total fluids from the Delaware Seep Remediation System, included as part of the Phillips Island Upper System, are pumped to the Phillips Island Lower System and then to the facility's process sump (W-21 Sump). Pneumatic cycle counters were installed on each recovery well to estimate groundwater pumping totals.

System operational data for the Delaware Seep Remediation System is contained in the Phillips Island Remediation System summary in **Attachment 1**.

Groundwater Monitoring

Annual sitewide well gauging, which is typically conducted during the fourth quarter of each year, is used to identify the presence of LNAPL and determine groundwater flow patterns. The purpose of the annual groundwater sampling event is to evaluate groundwater concentration trends at the perimeter of the facility. The annual groundwater sampling program consists of sampling select perimeter wells throughout the MHIC.

Marcus Hook Tank Farm (Formerly No. 2 Tank Farm)

The former No. 2 Tank Farm (currently named the Marcus Hook Tank Farm and owned and operated by Sunoco Partners Marketing & Terminals, an Energy Transfer Partnership) is located approximately two miles north of the MHIC at the intersection of Market Street and Conchester Road in Aston, Pennsylvania. Although the former No. 2 Tank Farm is not part of the MHIC, nor the work being performed under the Pennsylvania One Cleanup Program, the remediation status of the former No. 2 Tank Farm will continue to be detailed in this report. The former No. 2 Tank Farm has two active total fluids remediation systems: the Separator Area Remediation System and the L-1 Pump House Remediation System.

Separator Area Remediation System

The Separator Area Remediation System includes eleven recovery wells (RW-1, RW-2, RW-3, RW-4, RW-5, RW-7, RW-9, RW-13, RW-14, RW-16, and RW-17). Groundwater discharge process piping and compressed air supply lines required for each recovery well were placed below grade in order to operate the remediation system year-round.

Each well contains a QED Environmental Systems Model AP-4+ Top Inlet Short Pneumatic AutoPump to recover groundwater and LNAPL. The pumps utilize compressed air which is supplied by a Kaeser rotary screw air compressor. The total fluids are processed through an OWS and the recovered groundwater is pumped to the Marcus Hook Tank Farm's separator which is subsequently pumped to the "5 Line", which discharges to the MHIC 15 Plant Separator. The system includes a Falmouth Falco 100 catalytic oxidizer to treat emissions from the OWS and LNAPL holding tank. The catalytic oxidizer was placed into operation on May 17, 2019. The recovered LNAPL is pumped to a 500-gallon holding tank that is periodically pumped out and the contents are recycled at the MHIC.

A total of 2,222,791 gallons of groundwater and 26 gallons of LNAPL were recovered by this system during the first half of 2021. Details of maintenance and performance data for the Separator Area Remediation System are presented in **Attachment 1**.

L-1 Pump House Remediation System

The L-1 Pump House Remediation System was upgraded in July/August 2015 to include pneumatic total fluids

pumps at ten recovery wells (MW-31, MW-41, MW-200, RW-104, RW-111, RW-114, RW-117, RW-119, RW-120, and RW-121). A two-inch HDPE lateral line connects each recovery well to a three-inch HDPE trunk line, which transfers the total fluids to the treatment system. All groundwater process piping and compressed air supply lines from the recovery wells to the treatment system trailer were installed approximately one-foot below grade in order to operate the remediation system year-round.

Each well consists of a pneumatic QED Environmental Systems Model AP-4+ Top Inlet Long AutoPump to recover groundwater and LNAPL. The pumps utilize compressed air which is supplied by a Kaeser rotary screw air compressor. Total fluids from the pneumatic pumps are processed through an OWS. Recovered groundwater is pumped through a three-inch diameter HDPE discharge line, installed approximately three feet below grade, to the "5 Line", which discharges to the MHIC 15 Plant Separator. Recovered LNAPL is stored in a 500-gallon holding tank that is periodically pumped out and the contents are recycled at the MHIC.

A total of 1,164,200 gallons of groundwater and 90 gallons of LNAPL were recovered by this system during the first half of 2021. Details of maintenance and performance data for the L-1 Pump House Remediation System are presented in **Attachment 1**.

Please direct any questions or comments to me at (302) 477-1305 or tldoerr@evergreenresmgt.com.

Sincerely,
Evergreen Resources Management Operations

Tiffiani L. Doerr, PG
Project Manager

Enclosures:
Attachment 1 – Remediation System Recovery Data

cc: Larry Matson, DNREC
Kevin Bilash, USEPA Region III
Bradford Fish, ET
Andrew Bradley, Stantec

File: Groundwater Remediation Status Report, First Half 2021
Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC

ATTACHMENT 1
Remediation System Recovery Data

Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC
System Operational Data
AOI 3: Laboratory Building Remediation System
First Half 2021

Date	LNAPL Recovered in Period (gallons)	Total LNAPL Recovered (gallons)	Groundwater Recovered in Period (gallons)	Total Groundwater Recovered (gallons)
04-Jan-21	2.1	65,882.2	60,680	25,476,318
11-Jan-21	32.9	65,915.1	89,640	25,565,958
19-Jan-21	50.6	65,965.7	36,740	25,602,698
25-Jan-21	44.2	66,009.9	85,420	25,688,118
01-Feb-21	41.3	66,051.2	103,760	25,791,878
09-Feb-21	47.0	66,098.3	92,810	25,884,688
16-Feb-21	67.5	66,165.8	123,530	26,008,218
22-Feb-21	49.3	66,215.1	99,640	26,107,858
05-Mar-21	59.8	66,274.8	138,580	26,246,438
10-Mar-21	1.7	66,276.5	124,352	26,370,790
19-Mar-21	48.5	66,325.0	65,400	26,436,190
23-Mar-21	2.2	66,327.2	95,889	26,532,080
30-Mar-21	9.9	66,337.1	95,889	26,627,969
05-Apr-21	11.1	66,348.2	82,191	26,710,160
12-Apr-21	122.0	66,470.2	95,889	26,806,049
20-Apr-21	22.4	66,492.5	109,588	26,915,636
26-Apr-21	62.5	66,555.0	82,191	26,997,827
04-May-21	53.8	66,608.9	109,588	27,107,415
10-May-21	21.4	66,630.2	82,191	27,189,606
17-May-21	50.4	66,680.7	54,794	27,244,400
28-May-21	44.2	66,724.9	51,205	27,295,605
01-Jun-21	57.1	66,782.0	62,697	27,358,302
07-Jun-21	309.2	67,091.2	17,990	27,376,292
14-Jun-21	21.5	67,112.8	16,240	27,392,532
21-Jun-21	65.7	67,178.4	235,421	27,627,953

	LNAPL Recovered (gallons)	Groundwater Recovered (gallons)
First Half 2021 Totals	**1,298**	**2,212,314**

Notes:
OWS: oil/water separator
LNAPL: Light Non-Aqueous Phase Liquid

The Laboratory Building Remediation System consists of 9 total fluids (groundwater and LNAPL) pumps (RW-5, RW-6, RW-7, RW-29, RW-30, RW-31, RW-32, RW-134, and RW-135). Product thicknesses are measured and pumps are turned on/off as needed based on recoverable product thickness accumulations in each well.

The system was operational for the reporting period with the following exceptions:

On March 5, RW-5, RW-6, and RW-7 were taken out of service due to fouling of system piping.

From March 19 to March 23, the system recovery was reduced due to fouling of system piping. On March 23, after the piping was jetted and OWS was cleaned, the system was returned to service.

From March 23 to May 17, the system flow meter was inoperable. An average recovery rate (13,698.5 gpd) was used during this period to estimate recovery totals.

On May 24, the system was inoperable due to fouling of the system piping. The piping was jetted and the system was returned to service. RW-134 was not operational and the pump was removed for service.

On June 1, the pump for RW-134 was serviced and reinstalled.

On June 4, the system was taken out of service in anticipation of forecasted heavy rain. On June 7, the system was restarted and returned to service.

Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC
System Operational Data
AOI 3: Mobile Solar Powered LNAPL Recovery Systems
First Half 2021

Date	Recovery Trailer 1 Well	LNAPL Recovered Trailer 1	Recovery Trailer 2 Well	LNAPL Recovered Trailer 2	LNAPL Recovered in Period (gallons)	Total LNAPL Recovered (gallons)
7-Jan-21	MW-492	1.1	MW-99	0.86	1.9	167.09
11-Jan-21	MW-492	1.9	MW-99	0.00	1.9	169.03
21-Jan-21	MW-492	0.0	MW-99	0.86	0.9	169.89
4-Feb-21	MW-492	2.2	MW-99	0.22	2.4	172.25
25-Feb-21	MW-492	0.9	MW-99	0.86	1.7	173.97
5-Mar-21	MW-492	1.1	MW-99	0.00	1.1	175.05
15-Mar-21	MW-492	1.1	MW-99	0.00	1.1	176.12
24-Mar-21	MW-492	0.0	MW-99	0.00	0.0	176.12
2-Apr-21	MW-492	0.4	MW-99	0.00	0.4	176.55
9-Apr-21	MW-492	0.9	MW-99	0.00	0.9	177.41
16-Apr-21	MW-492	0.6	MW-99	0.00	0.6	178.06
23-Apr-21	MW-492	0.4	MW-281	1.94	2.4	180.42
7-May-21	RW-20	6.0	MW-281	0.86	6.9	187.31
7-May-21	MW-492	0.6	MW-281	---	---	189.24
14-May-21	RW-20	0.9	MW-281	1.29	1.9	190.53
14-May-21	MW-81	3.2	MW-281	0.43	1.3	194.19
27-May-21	MW-492	0.0	MW-281	0.43	3.7	194.19
4-Jun-21	MW-492	0.2	MW-281	0.00	0.0	195.48
11-Jun-21	MW-492	0.0	MW-281	1.08	1.3	130.53

First Half 2021	LNAPL Recovered (gallons)
Total	30.3

Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC
System Operational Data
AOI 3: Green Street Remediation System
First Half 2021

Date	LNAPL Recovered	
	Period (gallons)	Total (gallons)
7-Jan-21	26.9	35,443.9
12-Jan-21	15.9	35,459.8
19-Jan-21	72.2	35,532.0
29-Jan-21	17.3	35,549.3
5-Feb-21	17.6	35,566.9
12-Feb-21	20.8	35,587.7
19-Feb-21	10.2	35,597.9
26-Feb-21	5.1	35,603.0
5-Mar-21	42.4	35,645.3
10-Mar-21	31.9	35,677.2
17-Mar-21	32.5	35,709.7
23-Mar-21	1.9	35,711.6
2-Apr-21	5.2	35,716.8
5-Apr-21	7.4	35,724.3
15-Apr-21	2.1	35,726.3
21-Apr-21	2.1	35,728.4
30-Apr-21	3.7	35,732.1
7-May-21	1.2	35,733.3
13-May-21	13.6	35,746.9
21-May-21	8.9	35,755.9
28-May-21	0.0	35,755.9
4-Jun-21	3.0	35,758.9
11-Jun-21	9.6	35,768.5
14-Jun-21	15.5	35,784.1
25-Jun-21	18.4	35,802.4

	LNAPL Recovered
First Half 2021	(gallons)
Total	385

Notes:

LNAPL: Light Non-Aqueous Phase Liquid

The Green Street Remediation System consists of an interceptor trench with a combination of 12-volt and pneumatic LNAPL skimming pumps at nine wells (S-1, S-2, S-3, S-4, S-5, SS-1A(new), P-3, P-4, and P-5) within the trench. Product thicknesses are measured and pumps are turned on/off as needed based on recoverable product thickness accumulations in each well.

The system was operational for the reporting period with the following exceptions:

On March 5, the compressor was inoperable. All pneumatic pumps were out of service until repairs were made to the compressor.

On April 2, the compressor was repaired and returned to service.

On April 5, the pumps in P-4 and S-5 were inoperable. The pumps were removed for maintenance.

On April 15, the pumps were reinstalled in P-4 and S-5, and returned to service.

On May 13, the pumps in S-1, S-2, S-3, and S-4 were inoperable. The pumps were removed for maintenance.

Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC
Remediation System Operational Data
AOI 4: 12 Tank Remedation System
First Half 2021

Date	Period Total Flow (gallons)	Total Flow (gallons)	Average Daily Flow (gpd)	LNAPL Recovered in Period (gallons)	Total LNAPL Recovered (gallons)
05-Jan-21	600	2,366,911	120	0.00	857.63
14-Jan-21	300	2,367,211	33	0.00	857.63
22-Jan-21	22,767	2,389,978	2,846	0.00	857.63
29-Jan-21	10,033	2,400,011	1,433	0.00	857.63
05-Feb-21	1,888	2,401,899	270	0.00	857.63
12-Feb-21	1,888	2,403,787	270	0.00	857.63
19-Feb-21	1,888	2,405,674	270	0.0	857.6
26-Feb-21	1,888	2,407,562	270	0.0	857.6
04-Mar-21	50,500	2,458,062	8,417	0.0	857.6
12-Mar-21	2,157	2,460,220	270	0.0	857.6
17-Mar-21	1,348	2,461,568	270	0.0	857.6
28-Mar-21	2,966	2,464,534	270	380.8	1238.4
30-Mar-21	3,983	2,468,517	1,992	8.0	1246.4
09-Apr-21	1,482	2,469,999	148	3.5	1249.9
14-Apr-21	670	2,470,669	134	24.5	1274.4
21-Apr-21	86	2,470,755	12	0.0	1274.4
27-Apr-21	0	2,470,755	0	0.0	1274.4
05-May-21	0	2,470,755	0	0.0	1274.4
14-May-21	0	2,470,755	0	0.0	1274.4
18-May-21	0	2,470,755	0	0.0	1274.4
28-May-21	0	2,470,755	0	0.0	1274.4
04-Jun-21	0	2,470,755	0	0.0	1274.4
09-Jun-21	0	2,470,755	0	0.0	1274.4
16-Jun-21	0	2,470,755	0	NM*	1274.4
22-Jun-21	5,468	2,476,224	911	NM*	1274.4

	Total Flow (gallons)	LNAPL Recovered (gallons)
First Half 2021 Totals	**109,913**	**417**

Notes:

gpd: gallons per day

LNAPL: Light Non-Aqueous Phase Liquid

NM : not measured

The 12 Tank System consists of 14 recovery wells (RW-3, RW-16, RW-17, RW-18, RW-147, RW-148, RW-160, RW-161, RW-162, RW-163, RW-165, MW-196, MW-197, and RW-272).

The system was operational for the reporting period with the following exceptions:
On January 14, the pump was reinstalled in RW-148 and returned to service.
During February, the flowmeter was not functioning properly. The recovery during this period was estimated using the average flow during 2020 (270 gpd). On February 26, the flow meter was repaired and returned to service.

On March 4, the pump was replaced in RW-148.

On March 17, pumps were installed in MW-196, MW-197, and RW-272.
On March 30, the pumps in RW-147, RW-148, and RW-161 were removed for maintenance.
On April 9, the pump in RW-3 was removed for maintenance.
On April 14, pumps were reinstalled in RW-147, RW-148, and RW-161 and returned to service.
On April 21, the system was turned off due to OWS equipment issues.
* On June 16, the OWS was bypassed and the system was returned to service.

Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC
Remediation System Operational Data
AOI 4: H-5/Post Road System
First Half 2021

Date	Total Flow (gallons)	Period Total Flow (gallons)	Calculated System Flow Rate (gpm)
7-Jan-21	14,925,016	170,496	11.8
12-Jan-21	14,987,080	62,064	8.6
21-Jan-21	15,033,477	46,397	3.6
26-Jan-21	15,051,189	17,712	2.5
4-Feb-21	15,078,405	27,216	2.1
11-Feb-21	15,121,950	43,546	4.3
19-Feb-21	15,348,434	226,483	19.7
26-Feb-21	15,371,114	22,680	2.3
4-Mar-21	15,400,922	29,808	3.5
11-Mar-21	15,436,202	35,280	3.5
17-Mar-21	15,460,826	24,624	2.9
25-Mar-21	15,488,474	27,648	2.4
1-Apr-21	15,495,530	7,056	0.7
8-Apr-21	15,531,616	36,086	3.6
16-Apr-21	15,559,264	27,648	2.4
23-Apr-21	15,583,456	24,192	2.4
27-Apr-21	15,592,096	8,640	1.5
5-May-21	15,605,920	13,824	1.2
14-May-21	15,625,360	19,440	1.5
18-May-21	15,634,000	8,640	1.5
28-May-21	15,668,560	34,560	2.4
4-Jun-21	15,689,829	21,269	2.1
9-Jun-21	15,708,333	18,504	2.6
16-Jun-21	15,731,517	23,184	2.3
21-Jun-21	15,752,253	20,736	2.9

	Recovery (gallons)
First Half 2021 Total	997,733

Notes:

LNAPL: Light Non-Aqueous Phase Liquid

gpm: gallons per minute

Pneumatic total fluids pumps are installed in nine recovery wells (RW-247, RW-248, RW-249, RW-250, RW-251, RW-252, RW-253, RW-254, and RW-255) pumping from around the H-5 Control Room and eight recovery wells (RW-4, RW-150, RW-151, RW-152, RW-155, RW-156, RW-157, and RW-201) pumping along Post Road. Historical recovery includes 31,709 gallons of LNAPL.

The Flow Rate is calculated based on the total water recovered in the period and the number of days in the period. In January 2021, to prevent fouling from suspended sediments in recovered groundwater, the system flowmeter was moved to a bypass recovery line. Flow rate (gpm) is monitored during weekly system inspections and is used in calculating system recovery.

The system was operational throughout the reporting period with the following exceptions:

On February 9, the system was taken out of service due to frozen water in the above ground discharge line.

On February 11, the system was returned to service.

On February 26, the pump in RW-250 was inoperable and removed for maintenance.

On March 4, pumps were reinstalled in RW-249 and RW-250, and returned to service.

On April 8, the pump in RW-151 was inoperable. The pump was removed for maintenance.

On May 18, a pump was reinstalled in RW-151, and returned to service. Additionally, the pump in RW-157 was replaced.

On June 16, the pump in RW-147 was inoperable. The pump was removed for maintenance.

Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC
System Operational Data
AOI 5: Middle Creek Remediation System
First Half 2021

Date	RW-A1	RW-B1	RW-B2	Total Period Groundwater Recovery (gallons)
	Total Flow (gallons)	Total Flow (gallons)	Total Flow (gallons)	
01/06/21	246	3,589	371	4,205
01/13/21	8,676	2,706	1,271	12,654
01/20/21	3,413	2,701	2,019	8,133
01/25/21	18,075	224	2,344	20,643
02/05/21	17,211	677	786	18,673
02/10/21	6,515	2,379	661	9,555
02/21/21	2,090	1,179	223	3,492
02/26/21	6,869	1,144	422	8,436
03/05/21	3,933	399	1,446	5,777
03/08/21	559	381	223	1,164
03/16/21	13,404	302	195	13,901
03/24/21	19,097	435	280	19,812
03/29/21	34,250	3,746	361	38,357
04/08/21	753	46	942	1,741
04/16/21	753	46	942	1,741
04/20/21	18,919	298	453	19,670
04/27/21	26,160	602	346	27,109
05/03/21	66	1,321	318	1,706
05/10/21	2	522	61	585
05/18/21	21	1,975	330	2,325
05/24/21	3,277	1,060	278	4,616
06/04/21	7,852	29,124	339	37,316
06/09/21	140	10,595	31	10,766
06/14/21	2,398	11,434	979	14,811
06/23/21	7,037	1,291	4,995	13,323

	Total Flow (gallons)
First Half 2021 Total	**300,510**

Notes:

Two groundwater interceptor trenches were installed between the 15 Plant Separator and Middle Creek in December 2008. Pneumatic total fluids pumps were installed in three wells (RW-A1, RW-B1, and RW-B2) within the trenches. Total fluids are conveyed to the 15 Plant Separator.

Groundwater recovery totals are calculated from the average gallons of recovery per cycle documented in the operations manual (0.14 gallons per cycle).

The system was operational for the reporting period with the following exceptions:
On March 30 and April 8, the system was turned off during construction of an equipment enclosure for weatherproofing. The system was returned to service between field construction activities.

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Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC
System Operational Data
AOI 6: Bulkhead Remediation System
First Half 2021

Date	Total Flow (gallons)	Total Groundwater Recovery (gallons)
5-Jan-21	152,878	20,438,073
13-Jan-21	169,211	20,607,284
19-Jan-21	74,985	20,682,270
25-Jan-21	85,857	20,768,126
4-Feb-21	84,691	20,852,817
9-Feb-21	56,074	20,908,891
19-Feb-21	153,588	21,062,479
24-Feb-21	91,205	21,153,684
2-Mar-21	125,077	21,278,761
10-Mar-21	156,969	21,435,729
17-Mar-21	62,764	21,498,494
24-Mar-21	73,828	21,572,321
29-Mar-21	138,543	21,710,864
5-Apr-21	114,976	21,825,840
12-Apr-21	173,265	21,999,105
20-Apr-21	104,977	22,104,081
27-Apr-21	70,025	22,174,106
4-May-21	59,688	22,233,794
10-May-21	53,903	22,287,698
18-May-21	72,583	22,360,281
25-May-21	55,869	22,416,149
1-Jun-21	60,076	22,476,225
8-Jun-21	60,683	22,536,908
16-Jun-21	91,427	22,628,335
22-Jun-21	44,293	22,672,628

First Half 2021 Total	Total Flow (gallons)
	2,387,433

Notes:
The Bulkhead Remediation System was started on November 5, 2012. Pneumatic total fluids pumps are installed in four recovery wells (RW-12, RW-13, RW-14, and RW-15). The system discharges directly to the facility's W-21 Sump, and estimated light non-aqueous phase liquid (LNAPL) recovery totals are reported jointly with the Phillips Island Remediation System LNAPL totals. Groundwater recovery totals are calculated from the respective average gallons recovery per cycle documented in the operations manual (RW-12: 0.14 gallons per cycle; RW-13, RW-14, and RW-15: 0.29 gallons per cycle).
The system was operational for the reporting period.

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Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC
System Operational Data
AOI 5/7: Phillips Island Remediation System

First Half 2021

Date	Upper Phillips Island System (gallons)	Lower Phillips Island System (gallons)	Delaware Seep (gallons)	Period Groundwater Recovery Volume (gallons)	Period LNAPL Recovery Volume (gallons)	Total LNAPL Recovery Volume (gallons)
5-Jan-21	736	1,024	650,210	651,970	0	64,262
13-Jan-21	736	1,024	496,176	497,936	131	64,392
19-Jan-21	552	768	412,454	413,774	0	64,392
25-Jan-21	552	768	416,720	418,040	151	64,543
2-Feb-21	736	1,024	481,957	483,717	0	64,543
9-Feb-21	644	896	507,205	508,745	267	64,810
16-Feb-21	644	896	388,400	389,940	0	64,810
24-Feb-21	736	1,024	555,948	557,708	0	64,810
2-Mar-21	552	768	396,981	398,301	151	64,961
8-Mar-21	552	731	430,278	431,562	106	65,066
16-Mar-21	736	975	634,452	636,163	0	65,066
24-Mar-21	736	1,024	683,576	685,336	70	65,137
29-Mar-21	460	640	260,504	261,604	60	65,197
5-Apr-21	644	896	361,822	363,362	0	65,197
12-Apr-21	644	896	403,448	404,988	85	65,283
22-Apr-21	920	1,280	593,630	595,830	0	65,283
27-Apr-21	460	640	360,525	361,625	55	65,338
4-May-21	644	896	519,534	521,074	0	65,338
10-May-21	552	768	191,213	192,533	488	65,826
18-May-21	736	1,024	430,662	432,422	0	65,826
25-May-21	644	896	336,598	338,138	121	65,946
1-Jun-21	644	896	396,651	398,191	543	66,490
8-Jun-21	644	896	375,525	377,065	272	66,761
15-Jun-21	644	896	387,326	388,866	0	66,761
22-Jun-21	644	896	385,837	387,377	166	66,927

	Groundwater Recovered	LNAPL Recovered
First Half 2021	**(gallons)**	**(gallons)**
Totals	**11,096,267**	**2,665**

Notes:

LNAPL: Light Non-Aqueous Phase Liquid

The Phillips Island Remediation System is comprised of sheet pile walls and a network of recovery wells. The Phillips Island Remediation System is operated and controlled by remediation equipment in two remediation buildings: the Phillips Island Upper System (Delaware Seep and West Wall recovery) and the Phillips Island Lower System. The Phillips Island Remediation System discharges directly to the facility; there are no separators, totalizers, or holding tanks associated with this recovery system. Groundwater recovery totals for the Delaware Seep recovery wells are calculated from the respective average gallons recovery per cycle documented in the operations manual (0.58 gallons per cycle) for the pump.

Estimated LNAPL recovery totals are calculated with product thickness measurements from the facility's W-21 Sump (10.08' [length] and 6.67' [width]).

The system was operational during the reporting period with the following exceptions:

On March 8, the pump in MW-114 was inoperable. The pump was cleaned and returned to service.

On March 16, the pump in MW-114 was removed for maintenance and replaced.

On May 10, the pump in OW-3 was inoperable. The pump was removed for maintenance.

On June 15, the pump in OW-4 was inoperable. The pump was removed for maintenance.

Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC
System Operational Data
Former No. 2 Tank Farm
Separator Area Remediation System

First Half 2021

Date	Groundwater Recovered in Period (gallons)	Total Groundwater Recovered (gallons)	Average Flow Rate (gpm)	LNAPL Recovered in Period (gallons)	Total LNAPL Recovered (gallons)
7-Jan-21	64,136	38,700,710	4.95	0.0	12,235.93
11-Jan-21	28,505	38,729,215	4.95	0.0	12,235.93
20-Jan-21	35,412	38,764,627	2.73	0.0	12,235.93
26-Jan-21	131,757	38,896,384	15.25	3.5	12,239.43
1-Feb-21	99,905	38,996,289	11.56	0.0	12,239.43
10-Feb-21	139,521	39,135,810	10.77	0.0	12,239.43
17-Feb-21	115,477	39,251,287	11.46	0.0	12,239.43
23-Feb-21	93,373	39,344,660	10.81	0.0	12,239.43
1-Mar-21	28,696	39,373,356	3.32	0.0	12,239.43
9-Mar-21	0	39,373,356	0.00	0.0	12,239.43
16-Mar-21	219,860	39,593,216	21.81	0.0	12,239.43
26-Mar-21	0	39,593,216	0.00	0.0	12,239.43
29-Mar-21	0	39,593,216	0.00	0.0	12,239.43
7-Apr-21	0	39,593,216	0.00	0.0	12,239.43
16-Apr-21	81,678	39,674,894	6.30	19.0	12,258.43
21-Apr-21	156,959	39,831,853	21.80	0.0	12,258.43
29-Apr-21	5,882	39,837,735	0.51	3.3	12,261.68
3-May-21	67,460	39,905,195	11.71	0.3	12,261.93
12-May-21	179,440	40,084,635	13.85	0.0	12,261.93
19-May-21	161,080	40,245,715	15.98	0.0	12,261.93
27-May-21	167,110	40,412,825	14.51	0.0	12,261.93
2-Jun-21	148,920	40,561,745	17.24	0.0	12,261.93
7-Jun-21	92,250	40,653,995	12.81	0.0	12,261.93
17-Jun-21	205,370	40,859,365	14.26	0.0	12,261.93
24-Jun-21	0	40,859,365	0.00	0.0	12,261.93

	Total Flow (gallons)	LNAPL Recovered (gallons)
First Half 2021 Totals	**2,222,791**	**26**

NOTES:

gpm: gallons per minute

LNAPL: Light Non-Aqueous Phase Liquid

OWS: Oil/Water Separator

The Average Flow Rate is calculated based on the total ground water recovered in the period and the number of days in the period.

The system was operational for the reporting period with the following exceptions:

On January 7, the system was taken out of service during maintenance activities. The system was returned to service upon the completion of the maintenance.

On January 11, the pump in RW-13 was cleaned, reinstalled, and returned to service.

On January 20, the pump in RW-13 was not operational. The RW-13 pump was cleaned and returned to service.

On March 1, the system was not operational due to an OWS high level alarm. The system was reset and returned to service with a reduced set of recovery wells. The pumps in RW-2, RW-5, RW-9, and RW-17 remained off.

From March 9 to March 16, the system was not operational due to a Falco catalytic oxidizer alarm.

On March 16, the Falco catalytic Oxidizer was repaired and the system was returned to service with pumps operating in recovery wells RW-1, RW-2, RW-9, and RW-16.

On March 26, the system was out of service due to fouling of the system's transfer pump.

On April 16, the transfer pump was repaired and system was returned to service.

From June 17 to June 24, the system was not operational due to fouling of the system piping. On June 24, the system piping was jetted and the system was returned to service.

Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC
System Operational Data
Former No. 2 Tank Farm
L-1 Pump House Remediation System
First Half 2021

Date	Groundwater Recovered in Period (gallons)	Total Groundwater Recovered (gallons)	LNAPL Recovered in Period (gallons)	Total LNAPL Recovered (gallons)
7-Jan-21	176,300	14,966,804	0.00	38,101.20
11-Jan-21	69,400	15,036,204	6.60	38,107.80
20-Jan-21	145,200	15,181,404	11.50	38,119.30
26-Jan-21	92,300	15,273,704	4.80	38,124.10
1-Feb-21	42,400	15,316,104	0.00	38,124.10
10-Feb-21	145,800	15,461,904	0.00	38,124.10
16-Feb-21	108,500	15,570,404	0.00	38,124.10
23-Feb-21	95,800	15,666,204	5.00	38,129.10
1-Mar-21	98,700	15,764,904	0.00	38,129.10
9-Mar-21	0	15,764,904	0.00	38,129.10
17-Mar-21	0	15,764,904	0.00	38,129.10
26-Mar-21	0	15,764,904	0.00	38,129.10
29-Mar-21	0	15,764,904	0.00	38,129.10
7-Apr-21	0	15,764,904	0.00	38,129.10
14-Apr-21	0	15,764,904	0.00	38,129.10
21-Apr-21	0	15,764,904	0.00	38,129.10
29-Apr-21	0	15,764,904	0.00	38,129.10
3-May-21	0	15,764,904	0.00	38,129.10
12-May-21	0	15,764,904	0.00	38,129.10
19-May-21	0	15,764,904	0.00	38,129.10
25-May-21	0	15,764,904	0.00	38,129.10
4-Jun-21	0	15,764,904	0.00	38,129.10
11-Jun-21	66,400	15,831,304	0.00	38,129.10
17-Jun-21	59,100	15,890,404	61.60	38,190.70
24-Jun-21	64,300	15,954,704	0.00	38,190.70

	Total Flow (gallons)	LNAPL Recovered (gallons)
First Half 2021 Totals	**1,164,200**	**90**

NOTES:

LNAPL: Light Non-Aqueous Phase Liquid

OWS: Oil/Water Separator

The L-1 Pump House Remediation System includes pneumatic total fluids pumps at ten recovery wells (MW-31, MW-41, MW-200, RW-104, RW-111, RW-114, RW-117, RW-119, RW-120, and RW-121).

The system was operational for the remainder of the reporting period with the following exceptions:

The pumps in RW-120, MW-41, MW-31, and MW-200 were returned to service during the beginning of the reporting period after repairs were made to the system control panel.

On January 20, the pump in RW-114 was removed for maintenance.

On February 1, the pump was reinstalled in RW-114 and returned to service.

On March 1, the system was turned off to observe apparent LNAPL thickness accumulations in wells.

On June 7, the system was restarted and the pumps in RW-104, RW-111, RW-117, and RW-119 were returned to service.

On June 24, the pumps in MW-31, MW-41 and MW-200 were returned to service.

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